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part of said second conductive pattern has a thickness smaller than said central part of said second conductive pattern.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1, 3-10, and 13 are pending in this application. Claims 2 and 11 have been canceled and claims 1, 3-4, 7, 9, and 13 have been amended by way of the present amendment. Claim 14 has been newly added.

Claims 1 and 6 are rejected under 35 U.S.C. §102(c) as being anticipated by Hirose et al. (U.S. Patent No. 6,122,170). Claims 3-4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hirose et al. and claims 8-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hirose et al. in view of Mertol (U.S. Patent No. 6,011,304). Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schulz-Harder et al. (U.S. Patent No. 5,981,036) in view of Kuhnert et al. (U.S. Patent No. 5,379,942). Claims 5 and 7 are objected to as being dependent upon a rejected base claim, but is indicated as being otherwise allowable.

Applicants acknowledge with appreciation the indication that claims 5 and 7 include allowable subject matter. In light of this indication, claim 7 has been amended to be in independent form and thus is believed to be allowable. Claim 5 has not been amended into independent form, as the Applicants respectfully submit that this claim is allowable based on its dependency on claim 4.

The Office Action indicated that figure 9 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. Figure 9 has been amended as set forth in the Letter Requesting Approval of Drawing Changes to indicate figure 9 as "Prior Art."

The drawings filed in the current application are objected to under 37 C.F.R. 1.83(a). Under 37 C.F.R. 1.83(a), it is specified that "the drawings in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol..." The Office Action states that the recitation in claim 3 is that "...the thickness of said second metal plate is equal to the thickness of said first metal plate..." is not shown in the drawings. The Applicants respectfully submit that this feature of claim 3 is illustrated in figure 2 by lower metal plate 13a and upper metal plate 13b. The disclosure accompanying figure 2 on page 10 discloses that "the upper metal plate 13b may be of any thickness, but is preferably as thick as the lower metal plate 13a in consideration for the ease of manufacturing management." Accordingly, lower metal 13a and upper metal plate 13b are disclosed in figure 2 with an arbitrary thickness and their detailed illustration is not essential for one of ordinary skill in the art to have a proper understanding of the invention. At least for this reason, the Applicants respectfully request reconsideration of the objection to the drawings under 37 C.F.R. 1.83(a).

Regarding the rejection of claims 1 and 6 under 35 U.S.C. §102(e), the Applicants respectfully request reconsideration as a *prima facie* case of anticipation has not been established. To establish a *prima facie* case of anticipation under 35 U.S.C. §102, a single prior art reference must describe each and every element as set forth in the subject claim. *Verdegaal Bros. v. Union Oil Co. Of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ...claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Also see M.P.E.P. §2131.

Claims 1 and 6, as amended, recite a semiconductor module mountable on an external heat sink. The semiconductor module comprises an insulating substrate and a mounting frame. The mounting frame is made of metal and has a mounting surface for contact with an external heat sink. The mounting frame includes a flange along a periphery thereof for engagement with a peripheral part of the insulating substrate at a first main surface. The flange is arranged to press the peripheral part of the insulating substrate toward the external heat sink to force the insulating substrate into pressure contact with the external heat sink. The mounting frame includes a first metal plate and a second metal plate. The first metal plate has the mounting surface. The second metal plate is disposed on the first metal plate and has a protrusion along a periphery thereof projecting from a periphery of the first metal plate to define the flange.

The Office Action cites fixing jig 3 of Hirose et al. to disclose the recited mounting frame. However, fixing jig 3 of Hirose et al. is unlike the mounting frame recited in claims 1 and 6, as the disclosed fixing jig does not include a first metal plate and a second metal plate. The Office Action states on pages 5 and 6 in the rejection of claim 2 under 35 U.S.C. §103(a) that "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to including two metal plates to form the mounting frame, which includes a first metal plate having said mounting surface; and a second metal plate disposed on said first metal plate and having a protrusion along a periphery thereof projecting from a periphery of said first metal plate to define said flange, since it has been held that constructing a formerly integral structure in various element involves only routine skill in the art." Despite the statements in the Official Action the recited prior art reference of Hirose et al. does not teach, suggest, or disclose the mounting frame as recited in claims 1 and 6. Accordingly, a *prima facie* case of anticipation has not been established. Further, a *prima facie* case of obviousness can not be established relying solely on Hirose et al., as

Hirose et al. does not teach or suggest all of the limitations set forth in the present invention. Further, the Applicants respectfully traverse any taking official notice that the mounting frame includes a first metal plate and a second plate.

Regarding the rejection of claims 3 and 4 under 35 U.S.C. §103(a) as being unpatentable over Hirose et al., the Applicants respectfully request reconsideration as a *prima facie* case of obviousness has not been established. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Second, there must be some suggestion or motivation in the references themselves to modify the reference or to combine reference teachings. Third, there must be a reasonable expectation of success for the modification or combination of references. Further, the teaching or suggestion to make the modification or combination of prior art and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Additionally, there must be particular finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge to the claimed invention to combine or modify references. *In re Kotzab*, 217 F.3d 1365, 55 U.S.P.Q.2d 1313 (Fed. Cir. 2000). Also see M.P.E.P. § 2143.

Claims 3 and 4 comprise the same limitations, discussed above, as claim 1. Accordingly, as discussed above, Hirose et al. does not teach or suggest all of the recitations of claims 3 and 4. Accordingly, a *prima facie* case of obviousness has not been established in the rejection of claims 3 and 4.

Regarding the rejection of claim 8 under 35 U.S.C. §103(a) as being unpatentable over Hirose et al. in view of Mertol, the Applicants respectfully request reconsideration as a *prima facie* case of obviousness has not been established. Claim 8 comprises the same

recitations as claim 1, discussed above. Claim 8 further recites that the substrate, first conductive pattern, and second conductive pattern of the insulating substrate have respective peripheries in alignment with each other. The flange presses the periphery of the first conductive pattern on which the semiconductor element is mounted toward the external heat sink, with an insulative material between the flange and the first conductive pattern.

Hirose et al. does not teach or suggest the recited mounting frame including a first metal plate and a second metal plate. Further, Hirose et al. does not teach or suggest a flange that presses the periphery of a first conductive pattern on which the semiconductive element is mounted toward an external heat sink. Mertol does not alleviate this deficiencies. Accordingly, a *prima facie* case of obviousness has not been established in rejection of claim 8.

Regarding the rejection of claims 9 and 10 under 35 U.S.C. §103(a), the Applicants respectfully request reconsideration as a *prima facie* case of obviousness has not been established. Claim 9 has been amended into independent form.

Claims 9 and 10 recite a semiconductor module mountable on an external heat sink. The semiconductor module comprises an insulating substrate, a mounting frame, a semiconductor device, a cylindrical case, and an insulative sealing material. The insulating substrate includes a substrate, a first conductive pattern which is formed on a first main surface of the substrate and a second conductive pattern which is formed on a second main surface of the substrate. The mounting frame has a mounting surface for contact with an external heat sink. The mounting frame includes a flange along the periphery thereof for engagement with a peripheral part of the insulating substrate at the first main surface. The flange presses the peripheral part of the insulating substrate toward the external heat sink to force the insulating substrate into pressure contact with the external heat sink. The semiconductor device is mounted on the first conductive pattern. The cylindrical case is

disposed on a main surface of the mounting frame which is on the opposite side of the heat sink. The case, mounting frame, and insulating substrate define a space surrounding the semiconductor device. The insulative sealing material fills the space.

Hirose et al. has been discussed above. Mertol relates to a stiffener ring attachment with holes and removable snap-in heat sink or heat spreader/lid. On page 7 of the Office Action, it is stated that "...Hirose et al. discloses all of the claimed invention except a cylindrical case disposed on a main surface of said mounting frame which is on the opposite side from said external heat sink; said case, said mounting frame and said insulating substrate defining a space surrounding said semiconductor device; and an insulative sealing material filling said space." The Office Action cites item 19 in Figure 12 of Mertol to teach or suggest a cylindrical case and cites capsule 6 of Figure 12 to teach or suggest the insulative sealing material. However, neither Figure 12 nor the accompanying description in the specification disclosed either a cylindrical case or an item 19. Accordingly, Mertol et al. does not alleviate the deficiencies of Hirose et al., which were identified in the Official Action. Accordingly, neither Hirose et al. nor Mertol, alone or in combination, teach or suggest all of the recitations of claims 9 and 10. At least for this reason, a *prima facie* case of obviousness has not been established in the rejection claims 9 and 10.

Regarding the rejection of claim 13 under 35 U.S.C. §103(a) as being unpatentable over Schulz-Harder et al. in view of Kuhnert et al., the Applicants respectfully request reconsideration as a *prima facie* case of anticipation has not been established. Claim 13 relates to an insulating substrate for a semiconductor module. The insulating substrate has a curved configuration in which a peripheral part of a mounting surface warps upwardly away from an external heat sink above a central part of the mounting surface. The insulating substrate comprises a substrate, a first conductive pattern formed on a first main surface of the substrate, and a second conductive pattern formed on a second main surface of the

substrate. Only the bottom surface of the second conductive pattern is curved because of a difference in thickness in a central part of the second conductive pattern and a peripheral part thereof.

Schulz-Harder et al. relates to a metal ceramic substrate. The Office Action states on page 8 that "Schulz-Harder et al. discloses all of the claimed invention except only the bottom surface of said second conductive pattern is curved because of a difference in thickness between a central part of said second conductive pattern and a peripheral part thereof."

Kuhnert et al. relates to a method for producing a semiconductor modular structure. The Office Action cites Figure 1 of Kuhnert et al. to teach that only the bottom surface of said second conductive pattern is curved because of a difference in thickness between a central part of second pattern and a peripheral part thereof. However, Kuhnert et al. does not alleviate the above-mentioned deficiency of Schulz-Harder et al., as Figure 1 and the remaining disclosure of Kuhnert et al. does not teach or suggest a second conductive pattern that is curved because a difference in thickness between a central part and peripheral part. Further, the disclosure of Kuhnert et al. does not teach or suggest an insulating substrate having a curved configuration in which a peripheral part of a mounting surface warps upwardly. This is evident and apparent, as the only component in Figure 1 that has a variation in thickness is pressure ram 7. However, pressure ram 7 is not analogous to the cited second conductive pattern. Accordingly, neither Schulz-Harder et al. nor Kuhnert et al. teach or suggest all of the recitations cited in claim 13. At least for this reason, a *prima facie* case of obviousness has not been established for the rejection of claim 13.

In view of the above, it is believed that this application is in condition for allowance, such a notice is respectfully solicited. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated.

Respectfully submitted,

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IN THE CLAIMS

Please cancel claims 2, 11, and 12.

Please amend claims 1, 3-4, 7, 9, and 13 as shown below.

1. (Amended) A semiconductor module mountable on an external heat sink, said semiconductor module comprising:

an insulating substrate for said semiconductor module, said insulating substrate including a substrate, a first conductive pattern formed on a first main surface of said substrate which is on the opposite side from said external heat sink, and a second conductive pattern formed on a second main surface of said substrate which is on the same side as said external heat sink and for contact with said external heat sink; and

a mounting frame made of metal and having a mounting surface for contact with said external heat sink, said mounting frame including a flange along a periphery thereof for engagement with a peripheral part of said insulating substrate at said first main surface, said flange pressing said peripheral part of said insulating substrate toward said external heat sink to force said insulating substrate into pressure contact with said external heat sink[.],

wherein said mounting frame further includes:

a first metal plate having said mounting surface and

a second metal plate disposed on said first metal plate and having a protrusion along a periphery thereof projecting from a periphery of said first metal plate to define said flange.

3. (Amended) The semiconductor module according to claim [2] 1.

wherein the thickness of said first metal plate is equal to the sum of the thickness of said substrate and the thickness of said second conductive pattern; and

wherein the thickness of said second metal plate is equal to the thickness of said first metal plate.

4. (Amended) The semiconductor module according to claim [2] 1,

wherein said insulating substrate further includes a third conductive pattern formed on said first main surface along a periphery of said substrate; and

wherein said flange and said insulating substrate contact each other, with said third conductive pattern therebetween.

7. (Amended) [The] A semiconductor module [according to claim 6,] mountable on an external heat sink, said semiconductor module comprising:

an insulating substrate for said semiconductor module, said insulating substrate including a substrate, a first conductive pattern formed on a first main surface of said substrate which is on the opposite side from said external heat sink, and a second conductive pattern formed on a second main surface of said substrate which is on the same side as said external heat sink and for contact with said external heat sink; and

a mounting frame made of metal and having a mounting surface for contact with said external heat sink, said mounting frame including a flange along a periphery thereof for engagement with a peripheral part of said insulating substrate at said first main surface, said flange pressing said peripheral part of said insulating substrate toward said external heat sink to force said insulating substrate into pressure contact with said external heat sink.

wherein said insulating substrate further includes a third conductive pattern formed on said first main surface along a periphery of said substrate,

wherein said flange and said insulating substrate contact each other, with said third conductive pattern therebetween.

wherein said third conductive pattern is formed partially to allow part of said flange to contact said third conductive pattern[:], and

wherein said mounting frame and said insulating substrate are bonded to each other with an adhesive filling a gap between part of said flange which is out of contact with said third conductive pattern and said first main surface.

8. (Amended) [The] Δ semiconductor module [according to claim 1.] mountable on an external heat sink, said semiconductor module comprising:

an insulating substrate for said semiconductor module, said insulating substrate including a substrate, a first conductive pattern formed on a first main surface of said substrate which is on the opposite side from said external heat sink, and a second conductive pattern formed on a second main surface of said substrate which is on the same side as said external heat sink and for contact with said external heat sink; and

a mounting frame made of metal and having a mounting surface for contact with said external heat sink, said mounting frame including a flange along a periphery thereof for engagement with a peripheral part of said insulating substrate at said first main surface, said flange pressing said peripheral part of said insulating substrate toward said external heat sink to force said insulating substrate into pressure contact with said external heat sink.

wherein said substrate, said first conductive pattern and said second conductive pattern of said insulating substrate have respective peripheries in alignment with each other; and

wherein said flange presses said periphery of said first conductive pattern on which a semiconductor element is mounted toward said external heat sink, with an insulative material between said flange and said first conductive pattern.

9. (Amended) [The] Δ semiconductor module [according to claim 1.] mountable on an external heat sink, said semiconductor module [further] comprising:

an insulating substrate for said semiconductor module, said insulating substrate including a substrate, a first conductive pattern formed on a first main surface of said substrate which is on the opposite side from said external heat sink, and a second conductive pattern formed on a second main surface of said substrate which is on the same side as said external heat sink and for contact with said external heat sink;

a mounting frame made of metal and having a mounting surface for contact with said external heat sink, said mounting frame including a flange along a periphery thereof for engagement with a peripheral part of said insulating substrate at said first main surface, said flange pressing said peripheral part of said insulating substrate toward said external heat sink to force said insulating substrate into pressure contact with said external heat sink;

a semiconductor device mounted on said first conductive pattern;

a cylindrical case disposed on a main surface of said mounting frame which is on the opposite side from said external heat sink;

said case, said mounting frame and said insulating substrate defining a space surrounding said semiconductor device; and

an insulative sealing material filling said space.

13. (Amended) [The] An insulating substrate [according to claim 11.] for a semiconductor module, said insulating substrate comprising a mounting surface, said mounting surface being adapted to be forced into pressure contact with an external heat sink by a mounting frame pressing a peripheral part of said insulating substrate.

said insulating substrate having a curved configuration in which a peripheral part of said mounting surface warps upwardly away from said external heat sink above a central part of said mounting surface.

said insulating substrate further comprising:

a substrate;

a first conductive pattern formed on a first main surface of said substrate which is on the opposite side from said external heat sink; and

a second conductive pattern formed on a second main surface of said substrate which is on the same side as said external heat sink and having a bottom surface serving as said mounting surface,

wherein only the bottom surface of said second conductive pattern is curved because of a difference in thickness between a central part of said second conductive pattern and a peripheral part thereof.

14. (New)